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New Species and Notes on Marine Algae from Hawai'i[1]

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ABSTRACT: Five new species are described: one in the brown algal genus *Padina* and four in the red algal genera *Hypoglossum*, *Spirocladia*, *Micropeuce*, and *Laurencia*. *Padina melemele* Abbott & Magruder differs from known *Padina* species because of extremely strong calcification on the ventral surface and a bright yellow color on the dorsal surface. *Hypoglossum wynnei* Abbott differs from other species of *Hypoglossum* in Hawai'i in having divided, ribbonlike segments and small, discrete sporangial sori. *Spirocladia hodgsoniae* Abbott shows distinctive holdfasts where proliferation of cortical cells connects decumbent axes and erect filaments. *Micropeuce setosus* Abbott is a minute species collected at 72 m depth, showing conspicuous bristlelike trichoblasts on each tetrasporangial segment. *Laurencia mcdermidiae* Abbott joins a number of species of *Laurencia* marked by their bright green color, ordinarily pink or red in other species. *Dudresnaya littleri* Abbott is proposed as a new name for *D. lubrica* Littler [non *D. lubrica* (Lyngbye) Trevisan], and taxonomic notes are given on *Trichogloea* species. *Halymenia maculata* J. Agardh, *Predaea laciniosa* Kraft, *Cubiculosporum koronicarpis* Kraft, and *Kallymenia sessilis* Okamura are given as new records.

NEW SPECIES OF MARINE algae from Hawai'i have been published recently (Norris and Abbott 1992, Abbott and Norris 1993) as well as new records (Hodgson and Abbott 1992) to allow uses of names and records in the preparation of a manual of Hawaiian marine algae. In this paper, *Laurencia mcdermidiae*, which was formerly confused with *L. nidifica*, is recognized as a new species. Four other new species from deep water join an increasing number of taxa that show extraordinary geographic distributional patterns, which would lead one to believe that more intensive and deeper collections throughout the Pacific basin might yield rather continuous patterns of distribution. Examples of currently disparate reports of several red algal species are *Predaea weldii* Kraft & Abbott (1971) first described from Hawai'i and later recorded from eastern Australia (Kraft 1984, Millar and Kraft 1993) and the recent collection of *P. laciniosa* Kraft (1984), originally from the Great Barrier Reef, reported in this paper from Hawai'i. Another example is *Gibsmithia hawaiiensis* Doty, first described from Hawai'i but subsequently reported from southern Japan, southern Luzon, Papua New Guinea, and New Caledonia. A triangular distribution is recorded in this paper for *Cubiculosporum koronicarpis* Kraft, originally described from the Philippines (Kraft 1973) and later from eastern Australia (Kraft and Huisman 1981). Latitudinal distributions may also be more common than currently appreciated. New records are reported here for *Kallymenia sessilis* Okamura (1934), previously known only from Japan, and *Halymenia maculata* J. Agardh (1884), from Mauritius and Vietnam.

MATERIALS AND METHODS

Field collections were preserved and stored in 4% formaldehyde-seawater and mounted on microscope slides following the methods of Tsuda and Abbott (1985). A few specimens were prepared on standard herbarium sheets. Both herbarium specimens and micro-

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scope slides labeled IA followed by a number are in collections of I. Abbott at the University of Hawai'i with the intention of transferring them to the B. P. Bishop Museum (BISH) and other herbaria as the study of them is completed. Slides labeled HMA or WHM are in BISH. Holotypes are now in the Bishop Museum.

DESCRIPTIONS OF NEW TAXA

PHAEOPHYTA

Order DICTYOTALES

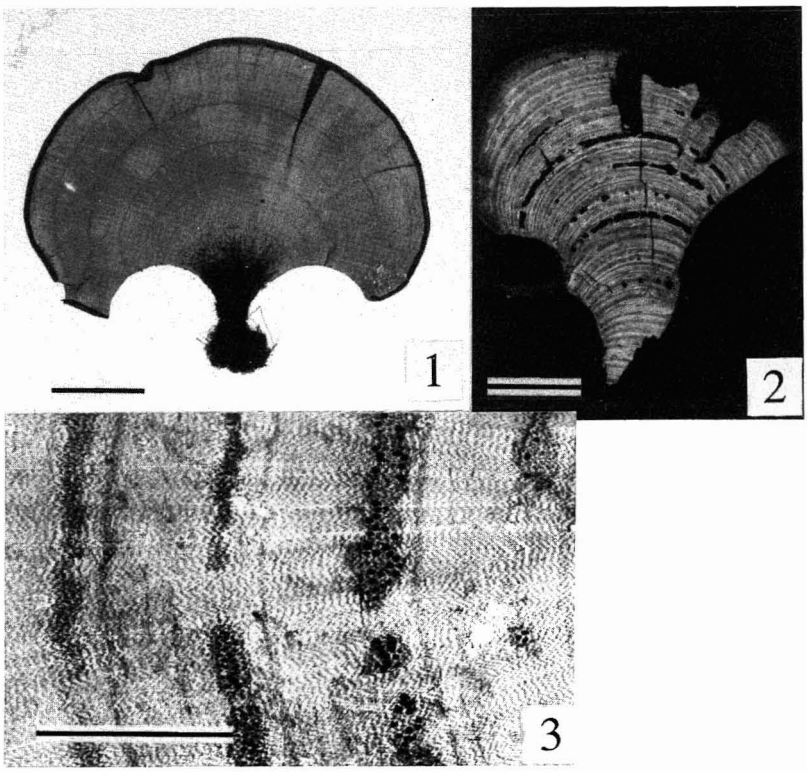
Family DICTYOTACEAE

Padina melemele Abbott & Magruder, n. sp.

Figures 1–3

Plantae 1–7 cm altae; frondes flabellatae, plerumque non fissae, segmentis paucis ubi fissae. Sytrata cellularum duo, 45–60 μm crassa calcificatione remota. Calcificatio crassa continuaque in latere interiore (ventral) margine involuta, efficiens paginam candidam contra paginam exteriorem (dorsalem) auream ad aurantiam. Sporangia pyriformia 85–110 μm diam., 115–145 μm longa, in pagina interiore formata, seriebus pilorum in pagina exteriore in utroque latere sporangiorum. Pili decidui, relinquentes cicatrices inconspicuas in seriebus.

Plants 1–7 cm tall; fronds fan-shaped, usually whole (Figure 1), but when split, the segments few (Figure 2). Two cell layers, 40–60 μm thick when decalcified. Calcification thick and continuous on inner (ventral) side with inrolled margin, forming brilliant



FIGURES 1–3. *Padina melemele*. (1) Habit of young, undivided frond, viewed from ventral surface. Scale = 10 mm. (2) Older, dissected frond viewed from ventral surface, showing nearly continuous chalky white surface. Scale = 10 mm. (3) Ventral surface showing details of sporangial rows alternating with thin rows of sterile hairs. Scale = 10 mm. (All, BISH 523616, from 'Īlio Point, Moloka'i Island).

white surface contrasted with bright yellow to dull orange outer (dorsal) surface. Sporangia pear-shaped, 85–110 μm diam., 115–145 μm long, formed on inner surface in arcs with hair rows on either side of them (Figure 3) on outer surface. Hairs deciduous, leaving faint scars in rows.

HOLOTYPE: Moloka'i Island: 'Īlio Point, dredged from 30 m depth on coral sand bottom by T. Matsui (Doty 19142K), 7 September 1959 (BISH 523616).

OTHER MATERIAL EXAMINED: Kaua'i Island: Kōloa Landing, 10–12 m depth, IA 18970, leg. M. Huddleston, 24 October 1988. O'ahu Island: Pūpūkea, leg. W. H. Magruder (no date). Moloka'i Island: 'Īlio Point, dredged from 27–36 m depth by T. Matsui (Doty 19137p), 7 September 1959.

ETYMOLOGY: *Melemele*, Hawaiian for yellow, is named for the bright yellow dorsal surface, an unusual color for macroalgae.

COMMENTS: Most described *Padina* species look much like the common intertidal specimens that are found throughout the Tropics; their taxonomy is difficult because of the many names that have been applied previously. The contrasting white and yellow surfaces of *P. melemele* mark it as different from the bulk of the species in the genus, which are usually tan to brown, with or without notable calcification. It is smaller than other Hawaiian species, which are also only intertidal. *Padina melemele* favors shady places on deep vertical walls or shallow caves where the apical margins hang below the holdfast.

W. H. Magruder is being given joint authorship because he furnished the photographs and persisted in believing that the species was new.

RHODOPHYTA

Order CERAMIALES

Family DELESSERIACEAE

Hypoglossum wynnei Abbott, n. sp.

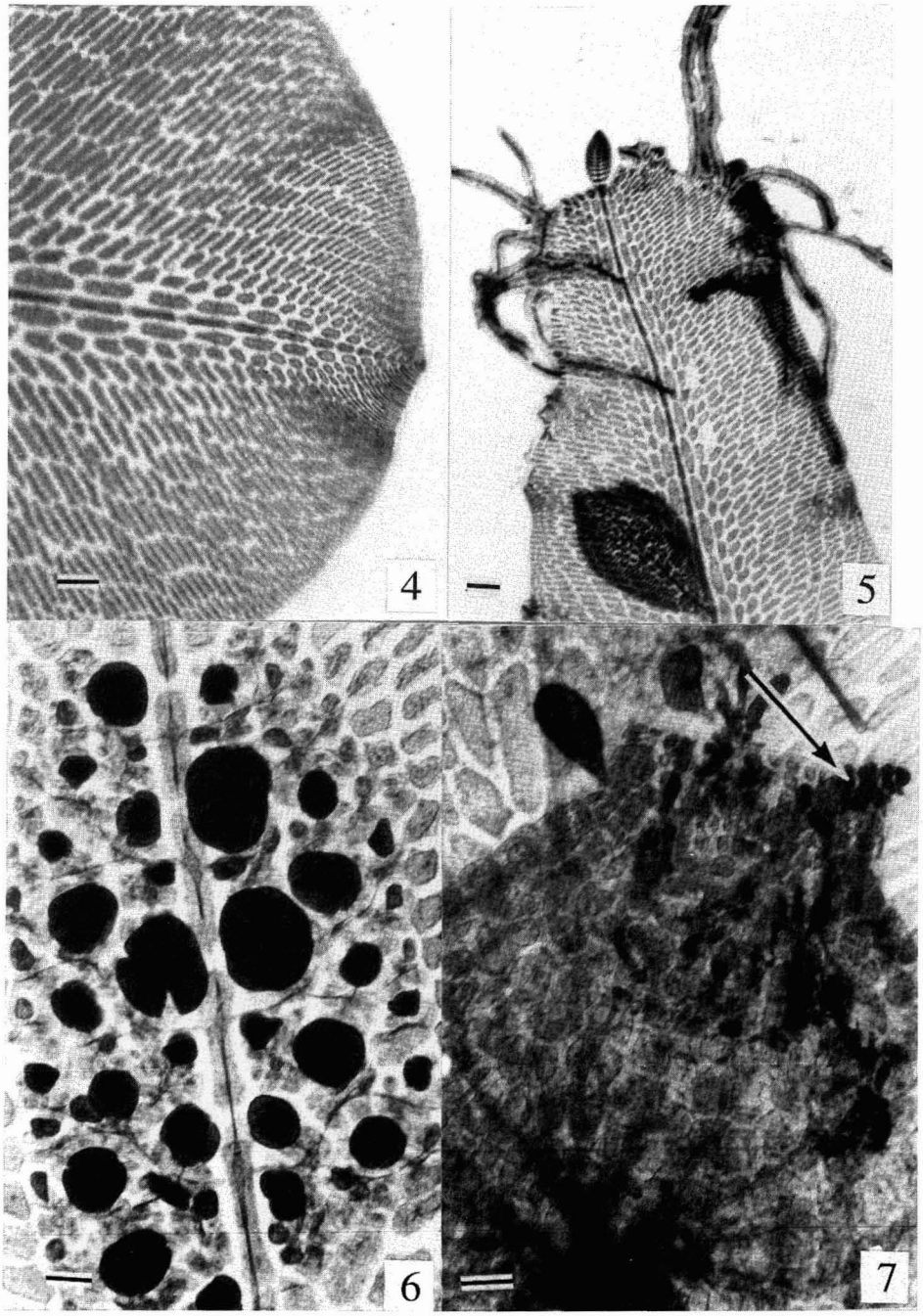
Figures 4–7

Plantae taeniformes, marginibus undulatis, usque ad 2.3 cm. Laminae primariae duplo vel triplo subdichotome divisae, divisionibus terminalibus longitudine prope aequalibus. Laminulae secundariae tertiariaeque ex costa. Rhizoidea interdum secus inferiorem marginem laminae primariae. Sori tetrasporangiorum parvi, obverse-ovati, parte distali latiore, 250 μm lati et 300 μm longi; sporangia formantia duas series utrinque costae. Cystocarpia 350–400 μm diam., circa 425 μm alta, ostiolo patenti. Spermatangia non visa.

Plants ribbonlike, with undulate margins (Figure 4), up to 2.3 cm long, the primary blades up to 1.5 mm broad, undivided, or divided subdichotomously two to three times, the terminal divisions nearly equal in length; secondary and tertiary bladelets from midribs; occasional rhizoids along lower margin of primary blade (Figure 5); rhizoids otherwise from disklike base; tetrasporangial sori (Figure 6) small, obovate, with distal portion broader, 250 μm wide by 300 μm long, sporangia forming rows two deep on both sides of midrib; cystocarps 350–400 μm diam., ca. 425 μm high with a flaring ostiole with terminal cells taller than broad (Figure 7). Spermatangia not seen.

HOLOTYPE: Wahikuli, Maui Island, 7.5 m depth, IA 21381 (BISH 634741), leg. L. M. Hodgson, 6 January 1994. Isotype, IA 21381a from the same collection. The specimens were attached to plants of *Spyridia filamentosa* (Wulfen) Harvey, which were in turn attached to *Halimeda incrassata* (Ellis) Lamouroux. The holotype consists of a pressed specimen and a microscope slide. Two isotype slides are also available.

OTHER MATERIAL EXAMINED: Wahikuli, Maui Island, IA 21811, epiphytic on *Melanamansia glomerata* (C. Agardh) R. E. Norris, leg. L. M. Hodgson, 5 September 1993; Wahikuli, IA 21465, epiphytic on *Anotrichium tenue* (C. Agardh) Naegeli, leg. L. M. Hodgson, 21 March 1994; Wahikuli, IA 21535, epiphytic on *Spyridia filamentosa*, leg. L. M. Hodgson, 21 March 1994; Honokaena Cove, IA 21891, leg. S. Hau, 6 October 1993. All



FIGURES 4–7. *Hypoglossum wynnei*. (4) Apex of blade showing midrib (IA 21381, holotype from Wahikuli, Maui Island). Scale = 50 μm. (5) Broken-off blade showing marginal rhizoids and two second-order bladelets being formed (IA 21535 from Wahikuli, Maui Island). Scale = 50 μm. (6) Detail of tetrasporangial sorus, forming on each side of midrib (IA 21381, holotype from Wahikuli, Maui Island). Scale = 50 μm. (7) Cystocarp lying on top of blade, with basal portion at bottom, and a few carposporangia around ostiole, which has modified terminal cells (arrow) (IA 21381, holotype from Wahikuli, Maui Island). Scale = 75 μm.

specimens were collected subtidally at 5 to 12 m depth.

ETYMOLOGY: This species is named for Professor Michael J. Wynne, University of Michigan, who is the leading student of the genus *Hypoglossum*, and who has helped me in understanding the numerous Hawaiian specimens.

COMMENTS: *Hypoglossum wynnei*, in terms of apical organization, is a member of the Type 1, *hypoglossoides* group of species in which all cells of the second-order cell rows bear third-order rows (Wynne 1988). It can be separated from other species of the genus in Hawai'i by its branched, broad ribbonlike thallus segments; the remaining species are essentially simple, slender, undivided blades, except for *H. caloglossoides* Wynne & Kraft, which is distinctive because of the catenate arrangement of blades. It differs from other tropical species, such as *H. anomalum* Wynne, in lacking branches that emerge between the midrib and margin, and from *H. barbatum* Okamura in lacking an attenuate apex and elongate tetrasporangial sori. From the simple blades of *H. simulans* Wynne, Price & Ballantine, *H. wynnei* differs by lacking the longitudinal rows of inner cells that in surface view parallel the midrib (Wynne et al. 1989). Finally, the spatulate to obovate blades of *H. minimum* Yamada (Yoshida and Mikami 1986) are unlike those of *H. wynnei*.

Family RHODOMELACEAE, *Lophothalia* group

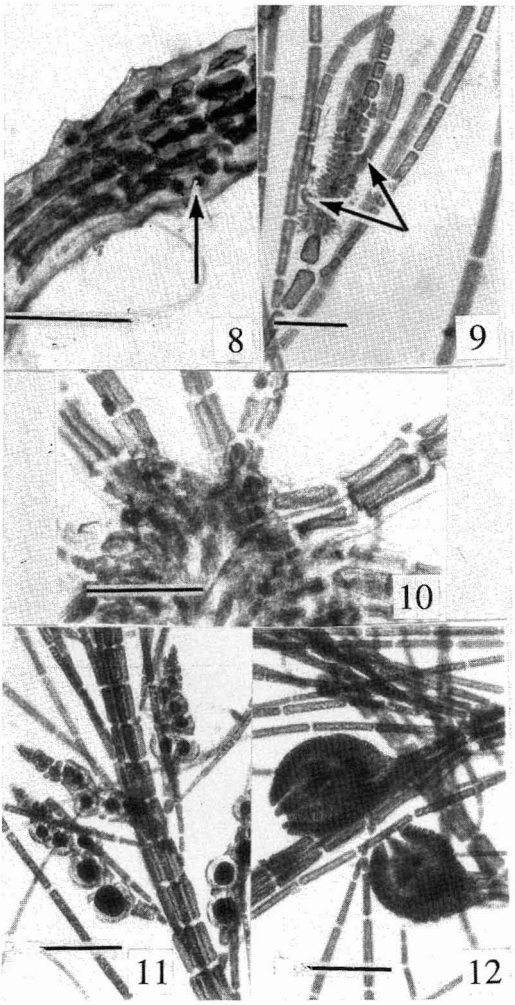
Spirocladia hodgsoniae Abbott, n. sp.

Figures 8–12

Plante dense cespitosae, usque ad 2 cm, basi contortuplicata ramis decumbentibus et erectis circa 130 μm, hapteris 1–pluribus ordinatis corticatis usque ad 600 μm diam. affixae. Ab infimo visae, cellulae hapteri effusae et furcatae, parietibus incrassatis peragratis rhizoideis internis ex cellulis inferioribus pericentralibus formatis. Bases ramorum erectorum cortice similari etsi limitato incrassatae; bases continguae plurium ramorum erectorum connexae, et auctae paucis rhizoideis uni-vel multicellularibus in axibus decumbentibus plerumque hic illic factis. Axes erecti ex textura basali formati, raro ramosi, vel ramosi dichotome propwe extremitates basales. Ceterae proprietates vegetativae et structurae reproductivae similes ceteris speciebus Spirocladiae.

Plants densely tufted, up to 2 cm tall, base entangled by decumbent and erect branches, these ca. 130 μm diam., fastened by one to several organized, padlike corticated holdfasts (Figure 10) up to 600 μm diam., from a bottom view filaments splayed out and forked, with thickened walls; internal rhizoids derived from lower pericentral cells lie along the thick wall; bases of erect branches thickened by similar though limited cortication (Figure 8), adjacent bases of several erect branches interconnected, supplemented by few unicellular or multicellular rhizoids, usually produced here and there on decumbent axes; erect axes formed from basal tissue, rarely branched, or branched dichotomously near their basal ends. Indeterminate branches few, replacing trichoblasts. Trichoblasts in upper half of plant, in 1/4 spiral, usually divided on second cell up from basal cell, rarely divided again; frequently trichoblasts undivided on spermatangial plants. Tetrasporangial stichidia (Figure 11) borne close to axis on second cell up from base, which bears one or two branches of trichoblast, stichidia ca. 35 μm broad, up to 0.8 mm long, occasionally with short, inconspicuous one- to two-celled sterile filaments within stichidium; tetrasporangia 65 μm diam. (n = 10, range = 60–68 μm) by only slightly longer (68 μm). Spermatangial heads (Figure 9) 92 μm wide, tapering to 31 μm at apices, up to 600 μm long, with conspicuous internal trichoblast branchlets, forming filaments to five or six cells (rarely more) in length with four or more uniseriate sterile cells terminating head. Cystocarps ovate (Figure 12), ca. 230 by 390 μm; carpospores 8–10 μm at their widest.

HOLOTYPE: IA 22041a (BISH 634742), Honokōwai, Maui Island, 5–7 m depth, epiphytic on a variety of macroalgae (*Melanamansia glomerata*, *Hypnea* spp., *Dictyota* spp.), leg.



FIGURES 8–12. *Spirocladia hodgsoniae*. (8) Cortications (arrow) on lower erect axes. Scale = 50 μm. (9) Spermatangial head with two trichoblast filaments (arrows), characteristic of the genus. Scale = 100 μm. (10) Holdfast of solid mass of corticated basal cells, characteristic of this species. Scale = 50 μm. (11) Stichidia of tetrasporangia, forming on trichoblasts. Scale = 150 μm. (12) Oval cystocarps with simple ostioles. Scale = 150 μm. (All from holotype or isotype slides, IA 22041 [BISH 634742] from Honokōwai, Maui Island).

L. M. Hodgson, 22 October 1994. Isotypes under the same number, from the same collection. The holotype is represented by several specimens on a herbarium sheet, with a spermatangial slide from the same collection. Isotype slides contain spermatangial, cystocarpic, or tetrasporangial plants, either separated or on the same slides. Isotypes are in BISH, UC, MELU, NSW, SAP. Dried herbarium material will be distributed also.

OTHER MATERIAL EXAMINED: O'ahu Island: Wai'alae Beach Park, intertidal on rock in turf, IA 21399, leg. C. M. Smith, 13 February 1994; Mākaha, subtidal, 7–15 m depth on *Spyridia filamentosa*, IA 18846, leg. L. M. Hodgson, 5 August 1988; same place, depth, collector, date, epiphytic on *Dictyota* sp., IA 18886. Maui Island: Puamana, east of Lahaina on rock, 8–10 m depth, IA 21851, leg. L. M. Hodgson, 9 October 1993; off Māla wharf, 7–9 m depth on eroded coral, IA 21393, leg. L. M. Hodgson, 13 February 1994; Honokōwai, 5–7 m depth, on variety of algae growing on *Halimeda incrassata*, leg. L. M. Hodgson, 22 October 1994 (including type material); Honokeana Cove, 10–12 m depth, on *Halimeda incrassata*, IA 21903, IA 21906–21909, leg. S. Hau, 6 October 1993. Except for the O'ahu collection, which was intertidal, all collections were subtidal from 5 to 10 m depth.

ETYMOLOGY: *Hodgsoniae* is named for the collector of the type material and my colleague, Lynn M. Hodgson, whose careful collections along the West Maui coast have yielded many interesting records and substantially increased our knowledge of the shallow and deeper water algae there.

COMMENTS: The occurrence of sterile filaments (modified trichoblasts) in the spermatangial heads and, to a lesser degree, their occasional presence in tetrasporangial stichidia is a generic-level characteristic of these small, superficially Polysiphonia-like plants. The vegetative structure and the basal portions of *S. hodgsoniae*, however, are very different from other species of the genus: *S. barodensis* Børgesen (1933) (the type), *S. minor* Nasr (1939) from the Red Sea, and *S. loochooensis* (Yendo) Yoshida (1989) from the Ryukyu Islands. Both *S. barodensis* and *S. loochooensis* are heavily corticated throughout the plants, whereas *S. minor* is corticated toward the base, and, as described above, *S. hodgsoniae* is particularly corticated at the

bases of erect branches and in the regions of attachment. None of these species has the clumping of cells, cortications, and branching at the base of the plant as does *S. hodgsoniae*.

Spirocladia barodensis was previously reported from Hawai'i by Hollenberg (1968). It is larger and nearly completely corticated.

Family Rhodomelaceae

Tribe Lophothalieae

Micropeuce setosus Abbott, n. sp.

Figures 13–16

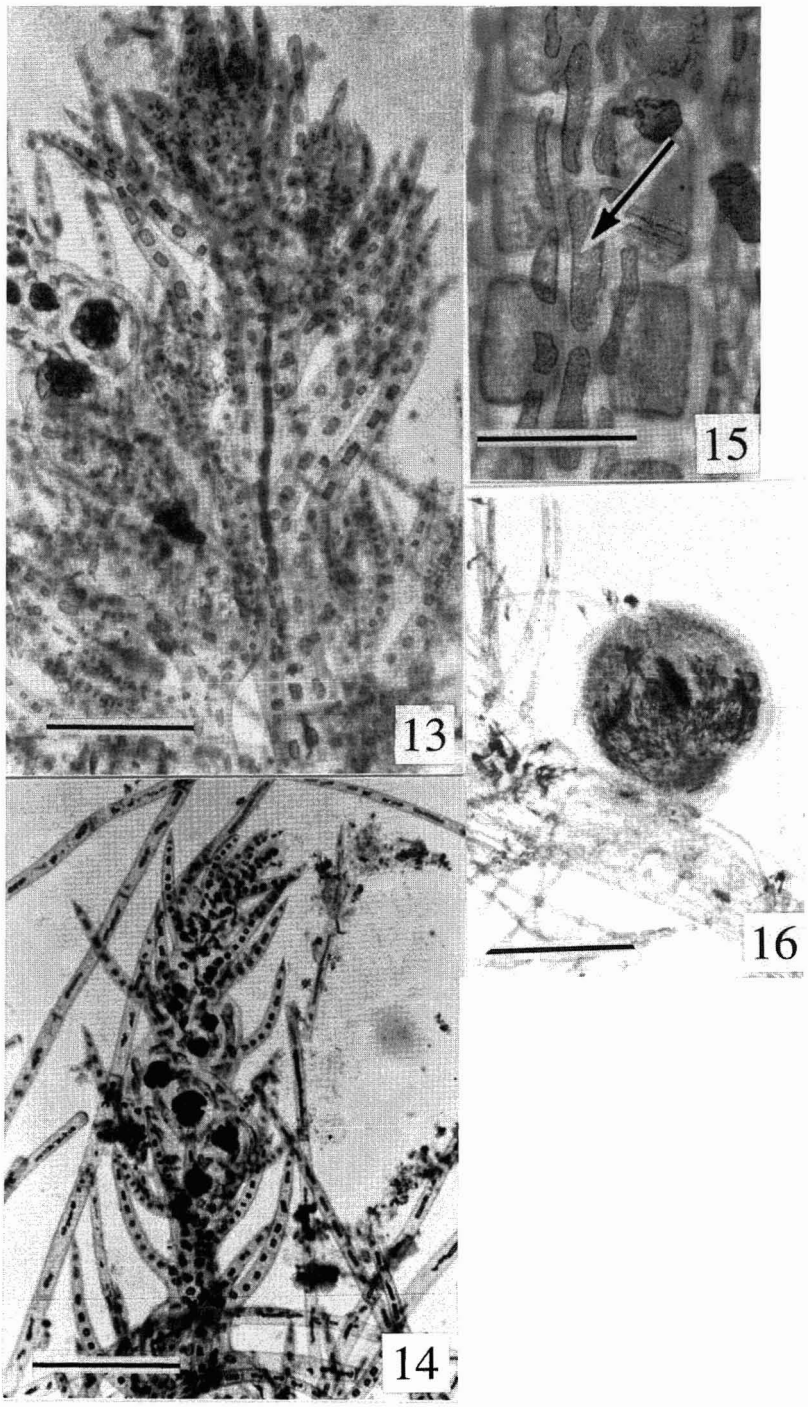
Thalli 14 mm alti, monopodiales, ordinati radialiter, ordinibus tribus ramificationis, cellulis pericentralibus quattuor; colorati trichoblasti persistentes, dispositi spiratim, vulgares; fila adventitia, haud distincta a trichoblastis, praesentes etiam. Rami indeterminati, volubiles circum axes, divisi irregulariter subdichotomeque. Axes trichoblastos ferentes, inferiores 2/3 axium principalium et lateralium corticati pseudoparenchymate. Tetrasporangia disposita in stichidiis torulosis terminibus axes principles lateralesquer; sporangia primo tetraedrice divisa, post aliam divisionem, constata ex octo sporis. Omne sporangium uno trichoblasto spiniformi, duabus cellulis obtegentibus presporangialibus, et una cellula obtangenti postsporangiali consociatum. Procarpia in cellula basali trichoblastium, unica grege cellularum sterilium. Initia pericarpia ante fecundationem formata. Cystocarpia sphaerica; spermatangia ignota.

Plants small, erect portions up to 3 cm tall, with monopodial axes, radially organized (Figure 13), lateral branches arranged in irregular spirals (Figure 14); axes up to 1.25 mm diam., very densely corticated below, bearing colored, persistent, uniseriate trichoblasts, these undivided and short in the upper portions of plant, becoming unequally furcate and up to 1.5 mm long in lower portions. Cell walls of trichoblasts about twice as thick as contents of cells. New adventitious branches, not distinguishable from trichoblasts, may be added to the axes, hence interrupting any definite pattern of branching if present. Apices of all determinate branches aculeate or abruptly spinous. Erect axes consisting of four pericentral cells, corticated first between pericentral cells (Figure 15), then spreading over them; axes becoming densely corticated proximal of midsections; axes 1.25 mm diam. at base, 45–60 μm through midsection of major laterals, tapering to 6–8 μm at apices. Tetrasporangia forming at the apices of young indeterminate branches, one per segment, alternating to the right and left in the fertile branch, segments swelling markedly during maturation. Tetrasporangia ca. 90 μm diam. when mature, dividing irregularly tetrahedrally, each sporangium associated with a short, unbranched trichoblast, two large slipper-shaped presporangial cover cells, and one postsporangial cover cell of smaller size and different shape. Procarps forming on basal cell of a trichoblast or within 10 cells of the base of an indeterminate branch, each procarp containing a four-celled carpogonial branch and one three-celled sterile cell group. Various numbers of pericarp initials are formed from the divided sterile pericentral cells before fertilization. Cystocarps (Figure 16) produced from main axes or near tops of lateral branches, involving cellular material of these axes in their bases, generally spherical, 500–800 μm diam., when mature with a beaked ostiole; if formed on an indeterminate lateral, the apex of the latter continues growth beyond the cystocarp.

HOLOTYPE: A microscope slide preparation, IA 16196 (BISH 634744). The material was collected on a piece of eroded coral on cruise no. 36 of R. V. *Townsend Cromwell* at Station 33, near 21° 3′ N and 157° 26′ W in Kalohi Channel between Moloka'i and Lāna'i Islands at an average depth of 72 m by B. Burch, 6 May 1968. Isotypes are three specimens under the same number.

OTHER MATERIAL EXAMINED: Dredged by R.V. *Townsend Cromwell* near the same location, BISH 508340, 508343, 508395, 625897, 630066 (on microscope slides). Number 508343 is cystocarpic; the remaining numbers are tetrasporangial or sterile.

ETYMOLOGY: *Setosus* (bristle) is named for the rigid, acutely pointed trichoblast present on each tetrasporangial segment.



FIGURES 13–16. *Micropeuce setosus*. (13) Distal portion of plant showing central axis and (left) terminal portion of indeterminate branch transformed into fertile branch (IA 16196, dredged by R.V. *Townsend Cromwell*). Scale = 1 mm. (14) Detail of fertile branch showing spinelike trichoblast associated with each tetrasporangial segment (IA 16196, dredged by R.V. *Townsend Cromwell*). Scale = 1 mm. (15) Cortication between pericentral cells (arrow), spreading over them as axis matures. Scale = 25 μm. (16) Lateral view of globose cystocarp (ostiole out of view), attached by very short stalk to main axis. Scale = 500 μm.

COMMENTS: *Micropeuce* contains six poorly known species, four from Australia and one each from the general Caribbean area and the Gulf of California, all of which are much larger than the Hawaiian species. The anatomy of the 12 small plants available of *M. setosus* shows that the species is closely related to *Lophothalia verticillata* (Harvey) Kützing (1849) in many features, as interpreted by Parsons (1975). Two features, the modification of terminal branches into stichidia of tetrasporangia and the persistent, colored trichoblasts, are considered to be important similarities. The two genera may differ in details of reproduction, which could not be completely studied because of the poorly preserved material. The genus *Micropeuce* as outlined by Kylin (1956:511) has five pericentral cells, whereas *M. setosus* has four, but the latter number is accommodated within the tribe Lophothalieae as circumscribed by Parsons (1975:685). From the best-described species of *Micropeuce, M. mucronata* (Harvey) Kylin by Joly and Oliveira (1966) as *Heterodasya sertularioides*, *M. setosus* is distinguished by being smaller, with four instead of five pericentral cells, and with simpler, mostly unbranched trichoblasts. Evaluation of these features is hampered by the rarity of collections.

Micropeuce has not previously been reported from the North Pacific.

Family RHODOMELACEAE, *Laurencia* group

Laurencia mcdermidiae Abbott, n. sp.

Figure 17

Plantae 5–6 cm altae, virides vividae, colorem retinentes exsiccatae, caespitosae, frondibus unibus ad aliquot superantibus ceteras. Axes teretes, 0.7–1.2 mm diam., ramosi radialiter; ramuli terminales vel simplices vel fasciculis brevibus ramuncolorum. Cellulae corticales subquadratae in sectione transversa, non protrudentes, 20–22 μm diam.; "corpora ceraqsi" praesentia. Cellulae medullae grandes parieytibus crassis, autem non crassitudinibus lenticularibus.

Plants 5–6 cm tall (Figure 17), bright green except for reddish bases of erect fronds,

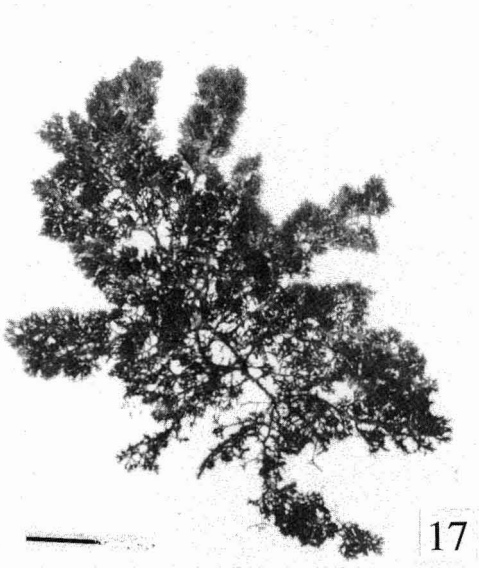


FIGURE 17. *Laurencia mcdermidiae*, habit of plant. Holotype, IA 21388, Makapu'u Point, O'ahu Island. Scale = 1 cm.

retaining color when dried, growing in clumps with several fronds overtopping others. Axes terete, 0.7–1.2 mm diam., densely radially branched, the terminal branchlets either simple or with short clusters of ultimate branchlets; in transverse section, cortical cells with secondary pit connections, subquadrate, not projecting, 20–22 μm diam., corps en cerise one to two (mostly two) per cortical cell. Mature medullary cells with very thick walls, as much as 1/5 the diameter of the cell, but with no lenticular thickenings. Tetrasporangia parallel type, each sporangium ca. 70 μm diam. No gametophytes seen.

HOLOTYPE: IA 21388 (BISH 634743), Makapu'u Point, O'ahu Island, leg. K. Beach, 7 February 1994. Isotypes: two sheets under the same number.

OTHER MATERIAL EXAMINED: O'ahu Island: IA 293, 295, near Hālona blowhole, leg. I. Abbott, 19 December 1943; IA 827, Diamond Head, leg. D. P. Abbott, 8 July 1945; IA 21325, Mākaha, leg. K. Beach, 3 June 1993. Maui Island: IA 14596, Hōkū'ula, near Hāna, 26 August 1976.

Previous reports of this species (some encompassing the description of *L. nidifica* J. Agardh) were made by Saito (1969), Abbott (1984), and as *Laurencia* species "green" by McDermid (1988: 244, figs. 34, 35) and Smith (1992). Besides O'ahu and Maui Islands, the distribution also includes the islands of Kaua'i, Moloka'i, and Lāna'i (McDermid 1988).

ETYMOLOGY: This species is named for Karla J. McDermid, who recently reviewed and identified Hawaiian species of *Laurencia*.

COMMENTS: This species was previously partially described and well illustrated as *Laurencia* "green" by McDermid (1988: 244–245, figs. 34–35). It was McDermid who pointed out the differences shown by this taxon from *L. nidifica*, with which it had been confused. McDermid (1988) found that the name *L. nidifica* should be applied to the reddish to straw-colored plants that showed lenticular thickenings (resembling a thickened U) in cells of the medulla, whereas the green ones (which she called *Laurencia* "green") differed in lacking these thickenings. Moreover, alternate-opposite branchlets were formed more densely (Figure 17) in *Laurencia* "green," whereas branching was more open and mostly alternate in *L. nidifica* (see McDermid 1988: figs. 18 and 20, the latter an illustration of the type specimen in the Agardh herbarium). McDermid (1988: 244) also stated that biochemical compounds in these two taxa were different.

Subsequently, other researchers have published on "green *Laurencias*," including Gil-Rodriguez and Haroun (1992), who compared seven "green" species (actually six, because *L. nidifica* is not green). Most of these taxa, including *L. viridis* Gil-Rodriguez & Haroun, have features resembling *L. mcdermidiae*. From *L. viridis*, *L. mcdermidiae* differs principally in the branching pattern and the very thick walls of the mature medullary cells. In an illustration from Gil-Rodriguez and Haroun (1992, fig. 1b), the plants show paniculate branching at the top of straight, naked axes about 1/2 the total length of the axis. In *L. mcdermidiae*, lateral branches are given off the central axis within 2 mm of the fleshy base and are radially branched throughout the upward course of the axis (ca. 5–6 cm); each lateral is rebranched once to three times, each order being shorter than the previous one. The total length of the lateral might be 3.5 cm, with a second-order spread of 0.5–1.0 cm, thus a very different habit from *L. viridis*.

MISCELLANEOUS NOTES

Dudresnaya littleri Abbott, n. name

Dudresnaya lubrica M. M. Littler, Br. Phycol. J. 9:149–156, figs. 1–20, 1974, a later homonym of *D. lubrica* (Lyngbye) Trevisan, Saggio monogr. alghe Coccotalle, p. 105, 1848 (basionym *Gigartina lubrica* Lyngbye, Tentamen, p. 45, pl. 12a, 1819).

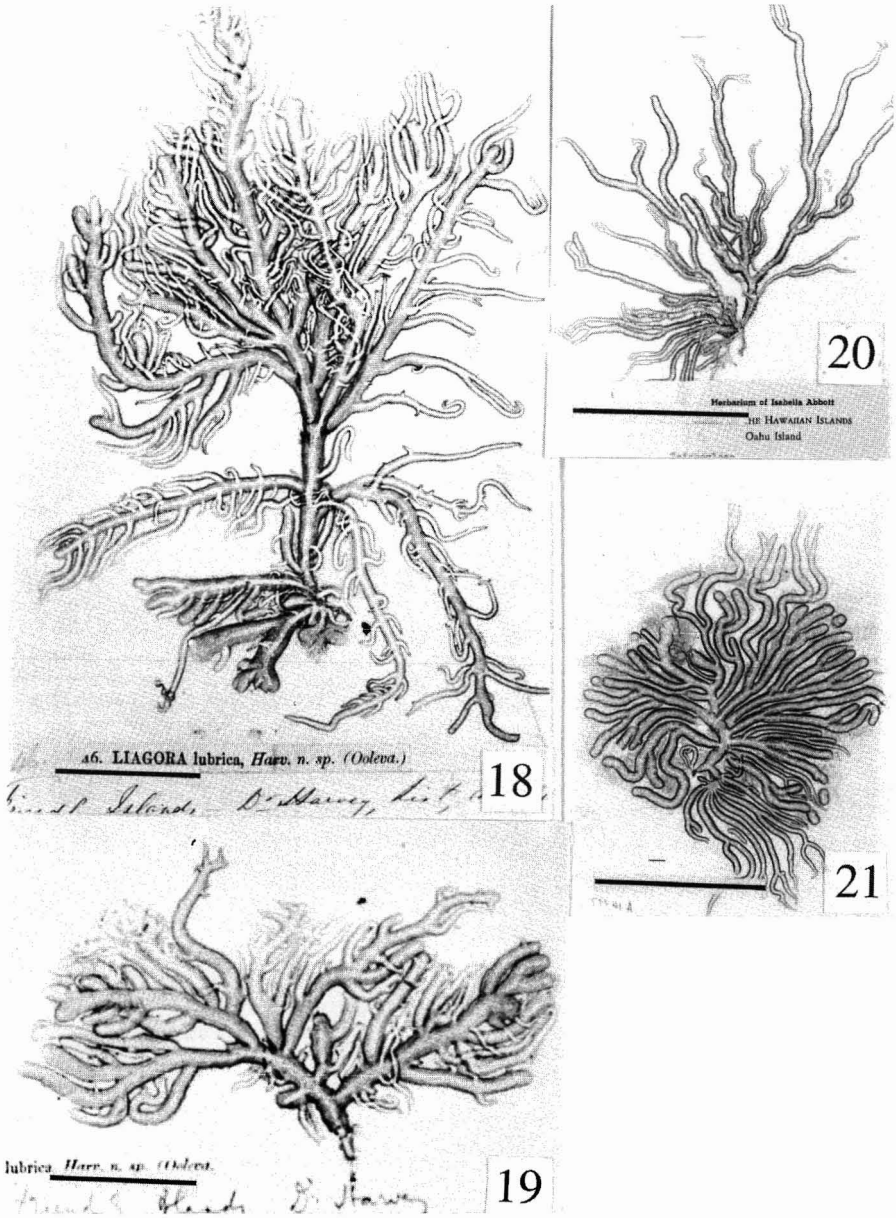
Dudresnaya littleri is not a common species in Hawai'i (its type locality). To my knowledge, it has only been collected once since its original collection at Pōka'i Bay, on the west coast of O'ahu Island. Nevertheless, it can be easily separated from the more common *D. hawaiiensis* R. K. S. Lee because of its more slender branches and shorter stature.

Trichogloea lubrica J. Agardh

Figures 18–21, 23

Trichogloea lubrica J. Agardh, Sp., gen., ord. algarum 3(1): 514, 1876. Synonyms: *Trichogloea subnuda* Howe, J. Wash. Acad. Sci. 24: 33–34, fig. 1, 1934. *Nemalion ramulosum* of Tilden in [Tilden's] American Algae, Century V, no. 419, 1900. *Liagora lubrica* Harvey, Friendly Island Algae, no. 46, nomen nudum.

Trichogloea lubrica takes on many branching patterns, and the sizes of branches vary from 2 to 8 mm diam.; hence if identification is being made on habit, it is easy to be in error. Indeed, it would be hazardous to use one plant form to exemplify any of the species of *Trichogloea*. Figures 18–19 illustrate type material (possibly isotypes) of *T. lubrica*, from the same collection from Tonga (the Friendly Islands). Figures 20–21 show two

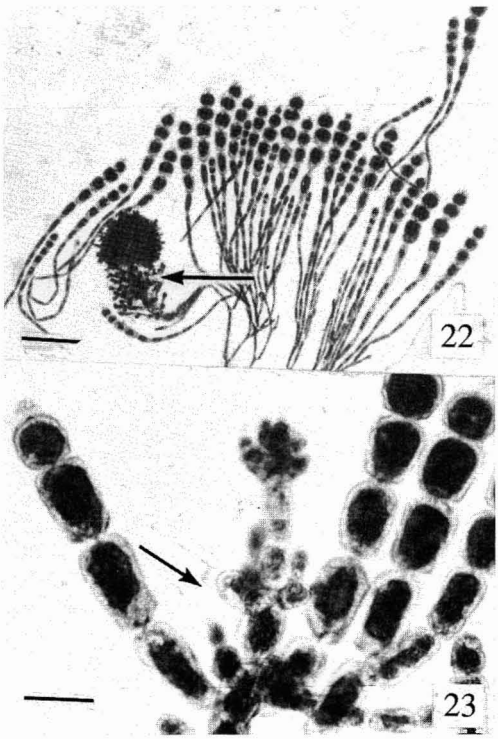


FIGURES 18–21. *Trichogloea lubrica*, showing four different habits that might be taken for specific differences, but whose anatomy is similar. (18–19) Isotype specimens under no. 46 of Friendly Islands Algae Exiccatae. Scale = 2.5 cm. (20) IA 16243 from Kualoa, O'ahu Island, lacking third and fourth orders of branching seen in Figure 18. Scale = 2 cm. (21) IA 14797 from Kawailoa, O'ahu Island. Scale = 2 cm.

specimens collected in different locations from Hawai'i, Figure 20 being the more common form. Similar variations in habits are displayed by *T. requienii* (Yoshizaki, 1979) and *T. herveyi* Taylor (1951, figs. A, B), leading to the conclusion that the external morphology is unreliable for identification. Internally, two features can be used: (1) the nature and

number of sterile filaments in the neighborhood of the carpogonium (i.e., on the carpogonial filament itself or adjacent to it) and (2) the involvement of cortical cells in the production of spermatangia. Examination of "type material" of *T. lubrica* shows that the sterile filaments may be present as single cells or short uniseriate filaments of two to three cells, occasionally with one or two single cells as "branchlets" (Figure 23) or lacking sterile filaments. Correlated with this condition are cortical cells that form clusters of spermatangia on a few of the distal cells including the terminal cortical cell. These conditions describe both *T. lubrica* and *T. subnuda* and make it necessary to place the second in synonymy with the first. The Hawaiian material upon which Howe (1934) based *T. subnuda* (from Kāne'ohe Bay, O'ahu Island) was earlier recognized as *T. lubrica* by Butters (1903), who made a careful and detailed study of reproductive structures. Unfortunately, this was published in an obscure journal and never gained the recognition the species deserved.

In contrast, *T. requienii* (Montagne) Kützing, a far more common species in Hawai'i, and in the world's collections that I have examined, has a very elaborate, dense series of sterile filaments on the carpogonial branch (Figure 22) and spermatangia that are formed on the intercalary (below the terminal) cortical cells, although occasionally the terminal cell is involved. I see the development of the sterile filaments on the carpogonial branches as evolutionarily the most important feature of *Trichogloea*, and, in my opinion, it forms a stable and useful taxonomic feature.



FIGURES 22–23. *Trichogloea*. (22) Cystocarp of *Trichogloea requienii*, the generitype, showing dense sterile filaments beneath gonimoblast (arrow) (E. Zablackis 1207, Kāne'ohe Bay, O'ahu Island). Scale = 100 μm. (23) Young gonimoblast of *Trichogloea lubrica*, showing few sterile filaments at base of fertile branch (arrow) (IA 16246, Kualoa, O'ahu Island). Scale = 25 μm.

NEW RECORDS

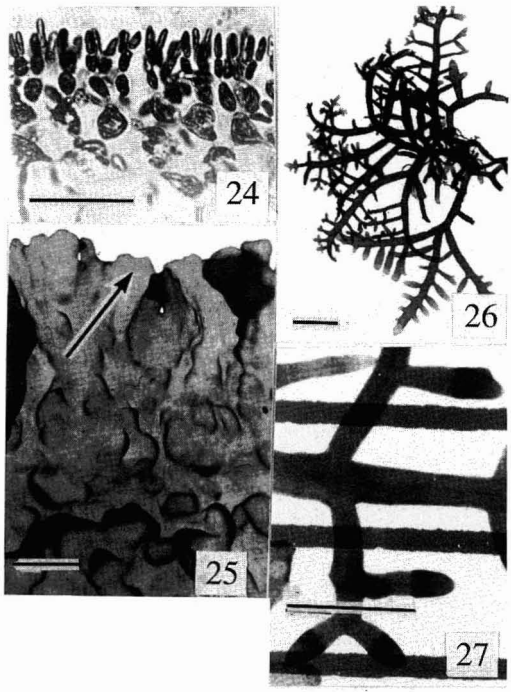
Halymenia maculata J. Agardh

Figure 24

Halymenia maculata J. Agardh, Lunds Univ. Arsskr. 21 : 12, 1884.

Plants are 5–7 cm tall (up to 25 cm in Mauritius, the type locality [Børgesen 1950]), often distinguished by a thickened, "woody" stipe that can compose 25–35% of the height. Originally circular blades become dissected, fringed, or ruffled with age; in cross section, the outer cortical cells are elongated and slender (Figure 24) and are characteristic of this species, as is the spotted appearance of the blade.

Collected in the shallow subtidal, to 3 m depth, the species was found on O'ahu Island at Ka'alāwai (IA 17682, 17684), Waikīkī (IA 19023), and Kawailoa, leg. W. H. Magruder, 25 May 1989. As well, it was collected on Maui Island at Waiehu (IA 21072) and Launiupoko (IA 14670).



FIGURES 24–27. (24) *Halymenia maculata*, cross section of cortex showing elongated outer cortical cells (IA 19245, between Mākena, Maui and Molokini, 5 m depth). Scale = 50 μm. (25) *Predaea laciniosa* showing blunt projections (arrow) and bullations on gelatinous surface (W. H. Magruder, s.n., Māʻili Point, Oʻahu Island). Scale = 5 mm. (26–27) *Cubiculosporum koronicarpus*. (26) Habit (HMA 767 from Mālaekahana, Oʻahu Island). Scale = 75 mm. (27) Apices of ultimate laterals showing swollen ends indicative of presence of cystocarps (HMA 767). Scale = 225 mm.

Predaea laciniosa Kraft

Figure 25

Predaea laciniosa Kraft, Phycologia 23:11–15, figs. 25–35, 1984.

This species is not as common as *P. weldii* Kraft & Abbott (1971) in Hawaiʻi. It differs from the latter in having projections from the blade that have blunt ends and by showing bullations on the gelatinous surface (Figure 25), whereas the projections on *P. weldii* are longer with ends more pointed and without bullations on the surface. *Predaea laciniosa* also has gland cells in the cortex, lacking in *P. weldii*, and terminally placed spermatangia on outermost cortical cells, whereas spermatangia are pinnately arranged in *P. weldii*.

HAWAIIAN DISTRIBUTION: Northwestern Hawaiian Islands at Laysan Island (IA 19115, 19116, leg. C. Agegian, June 1987); French Frigate Shoals (IA 19196, leg. C. Agegian, June 1987). Main Hawaiian Islands at Kāneʻohe Bay, Oʻahu Island, Kraft 1280 (in part). The Hawaiian Islands and Heron Island in the Great Barrier Reef are the two localities where the species has been found.

Cubiculosporum koronicarpis Kraft

Figures 26–27

Cubiculosporum koronicarpis Kraft, Am. J. Bot. 60:872–882, 1973.

This species was first described from the Philippines by Kraft (1973) and was subsequently reported from the southern Great Barrier Reef (North Island, 23°27′S) by Kraft and Huisman (1981). Externally, it might be taken to be a relative of *Gelidium* because of its flattened axes and pinnate branching (Figure 25). One of its characteristics, different from most red algae in Hawaiʻi, is the conspicuous terminal cystocarps at the ends of the ultimate laterals (Figure 26).

Plants were collected at Mālaekahana, Oʻahu Island, by W. H. Magruder, 4 February 1991 (HMA 747). As with some of the Philippine specimens and the Australian collection, the species grows from the shallow subtidal to 10 m depth, but in the Philippines it is intertidal as well.

Kallymenia sessilis Okamura

Kallymenia sessilis Okamura, Icones of Japanese Algae, 7:20, pl. 312, 1934.

This species was previously listed (Abbott 1989) from Kure Island in the Northwestern Hawaiian Islands as *Pugetia* species, but after fertile material was found on Oʻahu Island, *Kallymenia* is a better placement for the plants. The blades are thin, membranous, holdfast a thickened lower margin,

without a stipe; the subcortex shows conspicuous, large, spherical cells and stellate cells with inconspicuous, delicate arms. There is only one carpogonial branch per supporting cell ("monocarpogonial"). Other reproductive structures are as described by Okamura (1934: 20).

The species is known from the Northwestern Hawaiian Islands at Kure Island (IA 18450), French Frigate Shoals (IA 19192), and Nihoa Island (IA 20691). In the main Hawaiian Islands, it was collected at O'ahu Island, Waimea Bay, (IA 18117a, b) and at Pūpūkea (Jane Lewis 3382). A rich collection of more than 20 specimens was made off Blonde Reef, Hilo Bay, Hawai'i Island (IA 22533, leg. K. McDermid, 18 August 1995) at 6.5 m depth.

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